

## DETAILED ACTION

### *Examiner's Amendment*

1. During telephone conversation with Mr. Jens C. Jenkins (Reg. No. 44,803), Attorney for the Applicants on August 28, 2009 authorizations for this Examiner's amendment was given in a telephone interview.

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicants, an amendment may be filed as provided by 37 CFR1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

The application has been amended as follows:

#### *In the claims.*

1. (Currently Amended) A database management system that manages a database including a database data page, the database data page providing sub-page storage space, the database management system further managing a plurality of concurrent database transactions, each of the concurrent database transactions requiring a modification of the database data page and storing a respective copy of the database data page in a separate reserved space, the database management system comprising:

a processor; and

one or more physical computer readable storage media operatively coupled to the processor, the computer-readable storage media having stored thereon computer

executable instructions that, when executed by the processor, implement the database management system, including:

- a database engine that ~~that~~ employs a page aggregator component to facilitate operations of the concurrent database transactions at a sub-page level during modification of the database data page, the database engine comprising:

- a lock manager that enables sub-page level locking across the concurrent database transactions and that stores lock information, sub-page level locking grants one of the concurrent database transactions an exclusive lock on a first sub-page of the database data page when the one of the concurrent database transactions requests to modify the first sub-page, the exclusive lock permits the one of the concurrent database transactions to modify a copy of the first sub-page in its respective copy of the database data page while restricting others of the concurrent database transactions from modifying corresponding copies of the first sub-page in their respective copies of the database data page, but allows the others of the concurrent database transactions to modify other sub-pages[[.]];

- a page aggregator component that operates across the concurrent database transactions to obtain information on an aggregate size change that occurs on the database data page that results when the concurrent database transactions modify their respective copies of the database data page using sub-page level operations, the page aggregator operates across the concurrent database transactions by using the lock information

in the lock manager to track the sub-page level operations performed by the concurrent database transactions; and

a heap allocation component that employs the information on the aggregate size change to determine a space consumed on the database data page and a space available on the database data page to ensure that the plurality of concurrent multiple database transactions do not consume all of the storage space on the database data page.

13. (Currently Amended) In a database management system that manages a database including a database data page, the database data page providing sub-page row storage space, the database management system further managing a plurality of concurrent database transactions, each of the concurrent database transactions requiring a modification of the database data page, a method that facilitates synchronization of the concurrent database transactions comprising:

creating a copy of the database data page for each of the concurrent database transactions, each of the concurrent database transactions storing its respective copy of the database data page in a separate reserved space to facilitate modifying the database data page;

a lock manager assigning a plurality of exclusive row level locks to the concurrent database transactions, the exclusive row level locks granting assigning each of the concurrent database transactions a different particular row of the database data page and granting the corresponding database transaction

exclusive permission to modify ~~a different~~ the particular row in ~~their~~ its respective ~~copies~~ copy of the database data page, thereby restricting other of the concurrent database transactions from modifying the particular row;

storing information related to the exclusive row level locks assigned by the lock manager;

each of the concurrent database transactions modifying their respective copies of the database data page using row level operations to facilitate modifying the database data page;

a page aggregator obtaining information on an aggregate size change that occurs on the database data page as a result of the row level operations performed on each of the respective copies of the database data page by the concurrent database transactions, the information obtained at least in part by using the stored information related to the exclusive row level locks;

the page aggregator tracking a space consumed on the database data page and a space available on the database data page over all the concurrent database transactions; and

a heap allocator ensuring that the concurrent database transactions do not consume all of storage space on the database data page based in part on the tracked space availability available tracked by the page aggregator.

**Allowable Subject Matter**

2. Claims 1, 5, 9, 13, 16 – 17, 19, 21 and 37 are allowed over the prior art of record.
3. The following is an examiner's statement of reasons for allowance:

The reasons for allowance are based on applicant's persuasive remarks of July 8, 2009 (page 8) with emphasis on paragraphs 3 – 5.

4. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

**Conclusion**

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to FRED I. EHICHIOYA whose telephone number is (571)272-4034. The examiner can normally be reached on M - F 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pierre M. Vital can be reached on 571-272-4215. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Fred I. Ehichioya/  
Primary Examiner, Art Unit 2156